

REMARKS

Reconsideration of the above-identified patent application in view of the amendments above and the remarks following is respectfully requested.

Claims 1-23 are in this case. Claims 10-23 were withdrawn by the Examiner from consideration as drawn to a non-elected invention. Claims 1-5 and 7-9 have been rejected under § 102(b). Claims 1-9 have been rejected under § 103(a). Claims 5 and 7 have been objected to. Dependent claims 3 and 7 have been canceled. Independent claim 1 and dependent claims 5 and 8 have been amended. New independent claims 25, 27 and 31 and new dependent claims 24, 26 and 28-30 have been added.

Specifically:

Claim 1 has been amended to include the limitation of claim 3 that there is only one substantially annular flame holder. Correspondingly, claim 3 has been canceled.

New independent claim 25 is claim 1 with the limitations of claim 5 and with the additional limitation that the leading edge of the tubular element divides the airflow from the primary compressor into only two airflows: the outer airflow between the tubular element and the outer casing and the inner airflow between the tubular element and the inner casing. Support for the additional limitation is found in the specification in Figure 4 and the accompanying text. In Figure 4, annular flame holder **84** is a “tubular structure” (page 14 lines 20-21) whose leading edge divides the airflow from the primary compressor into only (page 14 lines 27-29)

...two different airflows, a first outer airflow between annular flame holder **84** and outer casing **62** and a second inner airflow between annular flame holder **84** and inner casing **60**.

New independent claim 27 is claim 1 with the limitation of claim 7 that there is a rotating diffuser between the primary compressor and the combustion chamber. Correspondingly, claim 7 has been canceled and claim 8 has been amended to depend from claim 27.

New dependent claim 24 adds to claim 1 the limitation that the flame holder is at least a portion of a substantially tubular element such as is recited in claim 5. New dependent claim 26 adds a similar limitation to claim 25. Support for these limitations is found in the specification in annular flame holder 84 that, as noted above, is an embodiment of the tubular element recited in claim 5.

New dependent claims 28-30 add to claims 1, 25 and 27, respectively, the limitation that the engine also includes a combustion chamber compressor, coaxial with and radially inward from (one of) the combustion chamber(s), that is configured to counteract axial backflow in the associated combustion chamber. New independent claim 31 is claim 1 as originally filed and also including this limitation. Support for this limitation is found in the specification on page 16 lines 10-19 and in claim 10 as filed.

§ 102(b) Rejections – Guirguis ‘995

The Examiner has rejected claims 1, 2 and 7-9 under § 102(b) as being anticipated by Guirguis, US Patent No. 4,897,995 (henceforth, “Guirguis ‘995”). Applicant presumes that the Examiner intended to also reject claims 3 and 4 as anticipated by Guirguis ‘995 because on page 3 lines 6 of the Office Action the Examiner characterizes the liquid turbojet engine of Guirguis ‘995 as including “a single said flame holder; wherein said flame holder is included in said rotating assembly”. The Examiner’s rejection is respectfully traversed.

Claims 3 and 7 have been canceled, thereby rendering moot the Examiner's rejection of these claims.

Guirguis '995 teaches a liquid turbojet engine whose rotor 13 rotates within a housing 2. The axially central portion of rotor 13 is a combustion ring 5 with an intermediate recess 9. Combustion ring 5 and housing 2 define between them a combustion section 5a. The axially forward portion of rotor 13 is a front impeller 4 with radially extending pump blades 4b.

Claim 1 as now amended is claim 3 rewritten in independent form. With regard to this claim, the Examiner has identified the "bluff wall" of combustion ring 5 and recess 9 as a flame holder. That these components of the liquid turbojet engine of Guirguis '995 are not a flame holder can be appreciated from the function of a "flame holder" as described on page 11 lines 18-20 of the specification:

A primary zone for combustion is created by rotating flame holders 58, generating a homogeneous annular flame.

In other words, a flame holder is supposed to create a *limited zone* of combustion within a combustion chamber. This is not what happens relative to the "bluff wall" of combustion ring 5 and recess 9 of Guirguis '995. In addition to combustion inside recess 9, there also is combustion essentially anywhere in combustion section 5a because (column 6 lines 6-10)

The self sustaining bubble ignition occurs in one of two ways, or a combination of the two ways. The first way involves pressure waves generated when the bubbles ignite and travel locally in all directions igniting incoming gas bubbles. (emphasis added)

Continuing in column 6 lines 10-15,

The shape of the combustion section and the compression section does not totally prevent the pressure waves from propagating upstream into the compression section. However, the shape substantially weakens these pressure waves such that they cannot ignite the bubbles in compression section 4a.

But the pressure waves can and do ignite the bubbles anywhere in combustion section 5a. More combustion occurs in the recirculation zone downstream of step 9a of recess 9 (column 6 lines 23-30). The actual function of recess 9 is to equalize pressure between the circumferential conduit sections (column 4 lines 45-47) and to accumulate bubbles for ignition (column 5 lines 62-68).

Hence, claim 1 is allowable in its present form over Guirguis '995. It follows that claims 2, 4 and 9 that depend therefrom also are allowable over Guirguis '995.

New claim 27 is claim 7 rewritten in independent form. With regard to this claim, the Examiner has identified the right end portion of blades 4b as a rotating diffuser. That the right end portions of blades 4b do not constitute a rotating diffuser can be appreciated from the function of a diffuser as described on page 10 lines 19-21 of the specification:

In an OCN engine the rotating diffuser directs the air flow exiting the compressor towards the combustion chamber and converts relative velocity to static pressure. (emphasis added)

By contrast, the function of blades 4b is described in Guirguis '995 column 3 lines 63-66 as follows:

Blades 4b...are curved in the radial direction such that the centrifugal force resulting from their curvature balances the Coriolis component of the acceleration.

In order to accomplish this, blades 4b must change only the direction of the relative velocity of the fluid that they pump, and not the magnitude of the velocity of that fluid. Blades 4b are conventional radial compressor blades whose function is to increase total pressure, not to convert relative velocity into static pressure.

Hence, claim 27 is allowable over Guirguis '995. It follows that claim 8 that depends therefrom also is allowable over Guirguis '995.

§ 102(b) Rejections – Lévesque ‘619

The Examiner has rejected claims 1-5, 7 and 9 under § 102(b) as being anticipated by Lévesque, US Patent No. 4,368,619 (henceforth, Lévesque ‘619”). The Examiner’s rejection is respectfully traversed.

Claims 3 and 7 have been canceled, thereby rendering moot the Examiner’s rejection of these claims.

Lévesque ‘619 teaches a gas turbine in which a shaft 26 rotates within a housing 10. Shaft 26 bears compressor blades 28 and annular walls 56, 58 and 60. A diffuser section that includes walls 40, 42 and 43, an extension 40a of wall 40, a vane 88 and an annular wall 82 are indirectly secured to housing 10. Walls 40a and 60 define a primary combustion chamber. A secondary combustion chamber is defined in part by vanes 88 and an annular wall 82.

Claim 1 recites a rotating assembly and an outer casing, such that at least one combustion chamber is defined in the space therebetween. In the case of Lévesque ‘619, the two combustion chambers are not defined by the outer casing (housing 10) but by other components (extension 40a, annular wall 82 and vanes 88). If claim 1 had recited “...there being at least one combustion chamber defined in the space between etc.” then it could be argued that, to that extent, claim 1 is anticipated by Lévesque ‘619. But this is not what claim 1 recites. Claim 1 recites “so that at least one combustion chamber is defined in the space between etc.” (emphasis added).

As noted above, claim 1 is claim 3 rewritten in independent form and so recites a single flame holder. The Examiner has identified walls 40a, 60 and 82 as “flame holders”. That these components of the gas turbine of Lévesque ‘619 are not flame holders can be appreciated from the function of a “flame holder” as described on page 11 lines 18-20 of the specification:

A primary zone for combustion is created by rotating flame holders 58, generating a homogeneous annular flame.

In other words, a flame holder is supposed to create a limited zone of combustion *within* a combustion chamber. Walls 40a, 60 and 82 define the primary and secondary combustion chambers as a whole. As best understood, combustion occurs everywhere within the combustion chambers and does is not confined to restricted zones within the combustion chambers. See e.g. column 3 lines 39-42:

Rotation of the primary chamber also increases turbulence within the combustion chamber to render the air-fuel mixture more homogeneous and improves combustion.

and column 3 lines 48-52:

air under increased pressure, due to the rotation of the primary chamber, is also directed into the secondary chamber between walls 56 and 58 and vanes 62, 64, 70 and 72 to create greater pressure and greater turbulence in the secondary chamber.

The turbulence in the primary and secondary combustion chambers spreads out the combustion throughout these chambers. But even if walls 40a, 60 and 82 could be construed as flame holders, there then would be more than one flame holder in the gas turbine of Lévesque '619, not the *single* flame holder recited in claim 1.

Hence, claim 1 is allowable in its present form over Lévesque '619. It follows that claims 2, 4, 5 and 9 that depend therefrom also are allowable over Lévesque '619.

Although claims 2, 4 and 5 are allowable over Lévesque '619 merely by virtue of depending from claim 1, Applicant takes the liberty of pointing out additional reasons why these claims are allowable over Lévesque '619. Claim 2 recites a single annular combustion chamber, in contrast to the two combustion chambers of Lévesque '619. In the case of claim 4, this claim requires the flame holder to be included in the rotating assembly. Even if walls 40a and 82 could be construed as flame holders these walls are indirectly secured to stationary housing 10 and are not

part of the rotating assembly that is secured to rotating shaft 26. In the case of claim 5, the Examiner has identified wall 58 as a tubular element whose leading edge divides airflow from the primary compressor into an outer airflow between the tubular element and the outer casing and an inner airflow between the tubular element and the inner casing. But the leading edge of wall 58 divides airflow from the compressor into an inner airflow between walls 56 and 58 and walls 58 and 60. Wall 60 is not the “outer casing” of the gas turbine of Lévesque ‘619. Housing 10 is the “outer casing” of the gas turbine of Lévesque ‘619. Wall 56 is not the “inner casing” of the gas turbine of Lévesque ‘619. Shaft 26 is the “inner casing” of the gas turbine of Lévesque ‘619.

New claim 25 is claim 5 rewritten in independent form and also including the limitation that leading edge of the tubular element divides the airflow from the primary compressor into only two airflows: the outer airflow between the tubular element and the outer casing and the inner airflow between the tubular element and the inner casing. New claim 25 is allowable over Lévesque ‘619 for the reasons discussed above with regard to claims 1 and 5, other than the reasons that relate to the recitation in claim 1 of a single flame holder.

New claim 27 is claim 7 rewritten in independent form. This claim is allowable over Lévesque ‘619 by virtue of reciting a rotating diffuser. The diffuser section of the gas turbine of Lévesque ‘619 is secured to housing 10 and so is stationary.

**§ 103(a) Rejections – Karlby et al. ‘551 in view of either Spadaccini ‘087 or
Pillsbury ‘076**

The Examiner has rejected claims 1-4 and 9 under § 103(a) as being unpatentable over Karlby et al., US Patent No. 2,784,551 (henceforth, “Karlby et al.

‘551”) in view of either Spadaccini, US Patent No. 4,226,087 (henceforth, “Spadaccini ‘087”) or Pillsbury, US Patent No. 5,927,076 (henceforth, “Pillsbury ‘076”). The Examiner’s rejection is respectfully traversed.

Claim 3 has been canceled, thereby rendering moot the Examiner’s rejection of this claim.

The Examiner has failed to make a *prima facie* case for the obviousness of independent claim 1. As state in MPEP 2143.03,

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

Independent claim 1 recites a *single*, substantially annular flame holder. Karlby et al. ‘551 have radial flame holders 71. Pillsbury ‘076 teaches a gas turbine combustor 10 with a flame holder array 24 that has three concentric annular flame holders 26. Spadaccini ‘087 teaches a can-type combustor assembly 10 including a flame holder 16, and merely notes in passing (column 2 lines 31-32) that “...the combustor can be fabricated into a well known annular type rather than the can type”. Presumably, the flame holders of such an annular type combustor assembly would be annular, but, as in Pillsbury ‘076, there would be several annular flame holders, not just one flame holder.

With independent claim 1 allowable in its present form over the cited prior art it follows that claims 2, 4 and 9 also are allowable over the cited prior art.

**§ 103(a) Rejections - Lévesque ‘619 in view of Karlby et al. ‘551 and either
Spadaccini ‘087 or Pillsbury ‘076**

The Examiner has rejected claims 1-5, 7 and 9 under § 103(a) as being unpatentable over Lévesque ‘619 in view of Karlby et al. ‘551 and either Spadaccini ‘087 or Pillsbury ‘076. The Examiner’s rejection is respectfully traversed.

Claims 3 and 7 have been canceled, thereby rendering moot the Examiner's rejection of these claims.

The Examiner has cited Karlby et al. '551 only to "obviate any doubt" that Lévesque '619 teaches an annular flame holder. The arguments presented above that refute the Examiner's alleged demonstration of the obviousness of claim 1 from Karlby '551 in view of either Spadaccini '087 or Pillsbury '076 therefore also demonstrate that claim 1 is not obvious from Lévesque '619 in view of Karlby et al. '551 and either Spadaccini '087 or Pillsbury '076. With independent claim 1 allowable in its present form over the cited prior art it follows that claims 2, 4, 5 and 9 that depend therefrom also are allowable.

Karlby et al. '551, Spadaccini '087 and Pillsbury '076 are silent concerning a diffuser. Therefore, the arguments presented above that demonstrate that new claim 27 is allowable over Lévesque '619 also demonstrate that this claim is allowable over Lévesque '619 in view of Karlby et al. '551 and either Spadaccini '087 or Pillsbury '076.

§ 103(a) Rejections – any of the Lévesque '619 rejections, applied above, in view of Guirguis '995

The Examiner has rejected claim 8 under § 103(a) as being unpatentable over any of the Lévesque '619 rejections, applied above, in view of Guirguis '995. The Examiner's rejection is respectfully traversed.

It is demonstrated above that new claim 27 is allowable in its present form. It follows that claim 8 that depends therefrom also is allowable.

**§ 103(a) Rejections – Mortimer ‘496 in view of Karlby et al. ‘551 and either
Spadaccini ‘087 or Pillsbury ‘076**

The Examiner has rejected claims 1-5, 7 and 9 under § 102(b) as being unpatentable over Mortimer, US Patent No. 2,793,496 (henceforth, “Mortimer ‘496”) in view of Karlby et al. ‘551 and either Spadaccini ‘087 or Pillsbury ‘076. The Examiner’s rejection is respectfully traversed.

Claims 3 and 7 have been canceled, thereby rendering moot the Examiner’s rejection of these claims.

Mortimer ‘496 teaches a combustion turbine unit with a rotating compressor section B that rotates within a stationary compressor section A and a rotating turbine section E that rotates within a stationary turbine section D. The stationary compressor and turbine sections are connected by an outer annular combustion chamber wall C. The rotating compressor and turbine sections are connected by an inner annular combustion chamber wall G. Within the combustion chamber is a flame tube made of inner and outer circumferential walls O and O¹ that are supported by outer wall C.

The Examiner has cited Karlby et al. ‘551, Spadaccini ‘087 and Pillsbury ‘076 for the same reason as the Examiner cited these references for combining with Lévesque ‘619: neither Lévesque ‘619 nor Mortimer ‘496 teach flame holders. Therefore, the arguments presented above that demonstrate that independent claim 1 is not obvious from Lévesque ‘619 in view of Karlby et al. ‘551 and either Spadaccini ‘087 or Pillsbury ‘076 also demonstrate that independent claim 1 is not obvious from Mortimer ‘496 in view of Karlby et al. ‘551 and either Spadaccini ‘087 or Pillsbury ‘076. With independent claim 1 allowable over the cited prior art it follows that claims 2, 4, 5 and 9 that depend therefrom also are allowable.

New claim 25 is claim 5 rewritten in independent form and also including the limitation that leading edge of the tubular element divides the airflow from the primary compressor into only two airflows: the outer airflow between the tubular element and the outer casing and the inner airflow between the tubular element and the inner casing. The Examiner has identified inner circumferential wall O of Mortimer '496 as a tubular element whose leading edge divides the airflow from the compressor into two airflows. But the outer such airflow is between circumferential wall O and circumferential wall O¹, not between circumferential wall O and outer combustion chamber wall C, unlike the tubular element of claim 25 whose outer airflow is between the tubular element itself and the outer casing. If the Examiner instead were to identify outer circumferential wall O¹ as a tubular element whose leading edge divides the airflow from the compressor into two airflows, the inner such airflow would be between inner circumferential wall O and outer circumferential wall O¹, unlike the tubular element of claim 25 whose inner airflow is between the tubular element itself and the inner casing. If the Examiner instead were to identify the combination of circumferential walls O and O¹ as a tubular element whose leading edge divides the airflow from the compressor into multiple airflows, the airflow from the compressor would be divided into three airflows: an inner airflow between inner combustion chamber wall G and inner circumferential wall O, an intermediate airflow between inner circumferential wall O and outer circumferential wall O¹, and an outer airflow between outer circumferential wall O¹ and outer combustion chamber wall C, unlike the tubular element of claim 25 that divides the airflow from the compressor into only two airflows. It follows that new claim 25 is allowable over Mortimer '496 either alone or in combination with Karlby et al. '551 and either Spadaccini '087 or Pillsbury '076.

New claim 27 is claim 7 rewritten in independent form. With regard to this claim, the Examiner has identified inner combustion chamber wall G as a rotating diffuser. But even if inner combustion chamber wall G were to be construed as a diffuser, it would not be *between* the combustion chamber and the compressor, as recited in new claim 27. It follows that new claim 27 is allowable over Mortimer '496 either alone or in combination with Karlby et al. '551 and either Spadaccini '087 or Pillsbury '076.

§ 103(a) Rejections - Mortimer '496 in view of Karlby et al. '551 and either Spadaccini '087 or Pillsbury '076 and further in view of Danis et al. '070

The Examiner has rejected claim 6 under § 103(a) as being unpatentable over Mortimer '496 in view of Karlby et al. '551 and either Spadaccini '087 or Pillsbury '076 and further in view of Danis et al., US Patent No. 6,474,070. The Examiner's rejection is respectfully traversed.

It is demonstrated above that independent claim 1 is allowable in its present form. It follows that claim 6 that depends therefrom also is allowable.

Other New Claims

Although new claims 24 and 26 are allowable over the prior art cited by the Examiner merely by virtue of depending from claims 1 and 25, Applicant respectfully presents another reason why these claims are allowable. Claims 24 and 26 require the flame holder to be at least a portion of the tubular element whose leading edge divides the airflow from the compressor. This limitation is neither taught nor suggested by the prior art cited by the Examiner. For example, in Lévesque '619, the alleged flame holders are walls 40a, 60 and 82 and the alleged tubular element is wall 58.

Objections to the Claims

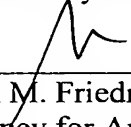
Claims 5 and 7 have been objected to for beginning with the label "c".

Claim 7 has been canceled, thereby rendering moot the Examiner's objection to this claim.

In claim 5, the objected label has been amended to "d".

In view of the above amendments and remarks it is respectfully submitted that independent claims 1, 25, 27 and 31, and hence dependent claims 2, 4-6, 8, 9, 24, 26 and 28-30, are in condition for allowance. Prompt notice of allowance is respectfully and earnestly solicited.

Respectfully submitted,



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